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program      comming

use msimsl

implicit none
integer      npurch,npers,iseed
real*8       theta,alphapbeta,alphap,betap,alphal,betal
real*8       thetap,alphapbetap
real*8       thetal,alphapbeta
real*8       thetaf,alphapbetaf
real*8       thetaff,alphapbetaff
real*8       alphaf,betaf,alphaff,betaff,pi0,ppurch
real*8       rannum(10)
real*8       tankcap,tankpct,ethpct,tankfill,tanklev,tanklevold
real*8       rvpbase,meanrvp,sdrvlp,mean2rvp
integer      initpurch,i,j
real*8,      dimension (:,:) , allocatable :: rvpvec,gasusedvec,ethpctvec
real*8       rvpboost
external     rvpboost

npers=1000
do while(npers.gt.0)
iseed = 2345872
call rnset(iseed)

read*,npurch,npers,thetap,alphapbetap,thetal,alphapbeta,thetaff,alphapbetaff,th
etaf,alphapbetaf
alphap = thetap*alphapbetap
betap = alphapbetap-alphap
alphal = thetal*alphapbeta
betal = alphapbeta-alphal
alphaff = thetaff*alphapbetaff
betaff = alphapbetaff-alphaff
alphaf = thetaf*alphapbetaf
betaf = alphapbetaf-alphaf
!   print*,"enter number of purchase events per individual"
!   read*,npurch

!   print*,"enter number of individuals"
!   read*,npers
if (npers.le.0) exit

allocate(rvpvec(npers,npurch))
allocate(gasusedvec(npers,npurch))
allocate(ethpctvec(npers,npurch))

!   print*,"enter ethanol gasoline market share"
!   print*,"enter purchase propensity alpha+beta"
!   read*,theta,alphapbeta
!   alphap = theta*alphapbeta
!   betap = alphapbeta-alphap

!   print*,"enter alpha and beta for tank level"
!   print*,"enter mean and alpha+beta for tank level"
!   read*,theta,alphapbeta
!   alphal = theta*alphapbeta

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!      betal = alphabeta-alpha
!
!      print*, "enter alpha and beta for fraction of fill-ups"
!      print*, "enter mean and alpha+beta for fraction of fill-ups"
!      read*,theta,alphabeta
!      alphaff = theta*alphabeta
!      betaff = alphabeta-alphaff
!
!      print*, "enter alpha and beta for fill distribution"
!      print*, "enter mean and alpha+beta for fill distribution"
!      read*,theta,alphabeta
!      alphaf = theta*alphabeta
!      betaf = alphabeta-alphaf
!
tankcap=20.0
rvpbase=7.0
ethpct=10.0
initpurch=20
!
do i=1,npers
!
!      generate for individual i the proportion ppurch
!      of times that eg is purchased, the probability pi0
!      that the tank is filled completely.
!
!      call drnbet(1,alphap,betap,rannum)
!      ppurch = rannum(1)
!      call drnbet(1,alphaff,betaff,rannum)
!      pi0=rannum(1)
!
!      initial tank fill, random choice from g and eg
!
!      tanklev=tankcap
!      if (drnunf().lt.ppurch) then
!          tankpct = ethpct
!      else
!          tankpct = 0
!      endif
!
!      first initpurch fills are not counted
!
!      do j=1,initpurch
!
!      how much has been used?
!
!      tanklevold=tanklev
!      call drnbet(1,alphal,betal,rannum)
!      tanklev = rannum(1)*tanklev
!
!      fill to what level?
!
!      if (drnunf().lt.pi0) then
!          tankfill=tankcap-tanklev
!      else
!          call drnbet(1,alphaf,betaf,rannum)
!          tankfill = rannum(1)*(tankcap-tanklev-1)+1
!      endif

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!
! fill with what kind of gasoline?
!

    if (drnunf().lt.p purch) then
        tankpct =
(tankpct*(tanklev+1)+ethpct*tankfill)/(tanklev+tankfill+1)
        else
            tankpct = tankpct*(tanklev+1)/(tanklev+tankfill+1)
        endif
        tanklev=tanklev+tankfill
    enddo

!
! next npurch fills are recorded
!

    do j=1,npurch

!
! how much has been used?

    call drnbet(1,alphal,betal,rannum)
    tanklevold=tanklev
    tanklev = rannum(1)*tanklev
    gasusedvec(i,j)=tanklevold-tanklev
    ethpctvec(i,j)=tankpct

!
! fill to what level?
!

    if (drnunf().lt.pi0) then
        tankfill=tankcap-tanklev
    else
        call drnbet(1,alphaf,betaf,rannum)
        tankfill = rannum(1)*(tankcap-tanklev-1)+1
    endif

!
! fill with what kind of gasoline?
!

    if (drnunf().lt.p purch) then
        tankpct =
(tankpct*(tanklev+1)+ethpct*tankfill)/(tanklev+tankfill+1)
        else
            tankpct = tankpct*(tanklev+1)/(tanklev+tankfill+1)
        endif
        tanklev=tanklev+tankfill
    enddo
enddo
do i=1,npers
do j=1,npurch
    rvpvec(i,j)=rvpboost(ethpctvec(i,j),rvpbase)
enddo
enddo
meanrvp=0
do i=1,npers
do j=1,npurch
    meanrvp=meanrvp+rvpvec(i,j)
enddo
enddo
meanrvp=meanrvp/(npers*npurch)

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sdrvlp=0
do i=1,npers
do j=1,npurch
    sdrvlp=sdrvlp+(rvpvec(i,j)-meanrvp)**2
enddo
enddo
sdrvlp=sqrt(sdrvlp/(npers*npurch-1))
mean2rvp=rvpboost(rvpbbase,rvpbbase)*thetap
print
1000,alphap,betap,alphal,betal,alphaff,betaff,alphaf,betaf,meanrvp,mean2rvp,sdrv
p
1000 format(8f9.5,2f8.5)
deallocate(rvpvec,gasusedvec,ethpctvec)
enddo
end

real*8 function rvpboost(ethpct,rvpbbase)
implicit none
real*8      ethpct,rvpbbase,a,b,c,d,denom,rvpmmax,rvpadj
    rvpmmax=1.11
    a=1/rvpmmax
    b=1.845516
    c=-.76405
    d=.837258
    denom=a+b*ethpct+c*ethpct**2+d*ethpct**3
    rvpboost=1.11-1.0/denom
    rvpadj=.05*(8.4-rvpbase)
    rvpboost=rvpboost*(rvpmmax+rvpadj)/rvpmmax
return
end

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